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Amended claims in accordance with Rule 137(2)
EPC.

(54) **ALL DIMENSIONS FREE CONNECTION MAGNETIC BUILDING BLOCK**

(57) The present disclosure provides a magnetic building block for connecting with other magnetic building block. The magnetic building block includes a base, a cover, at least one horizontal magnet and at least one vertical magnet. The base includes at least two vertical accommodate grooves and at least one horizontal accommodate groove. The cover is configured to connect with the base and cover the at least two vertical accommodate grooves and the at least one horizontal accommodate groove. The at least one horizontal magnet is located at the at least one horizontal accommodate groove. The at least two vertical magnets are located at the at least two vertical accommodate grooves respectively. Magnetic pole directions of two adjacent vertical magnets of the at least two vertical magnets are opposite to each other.

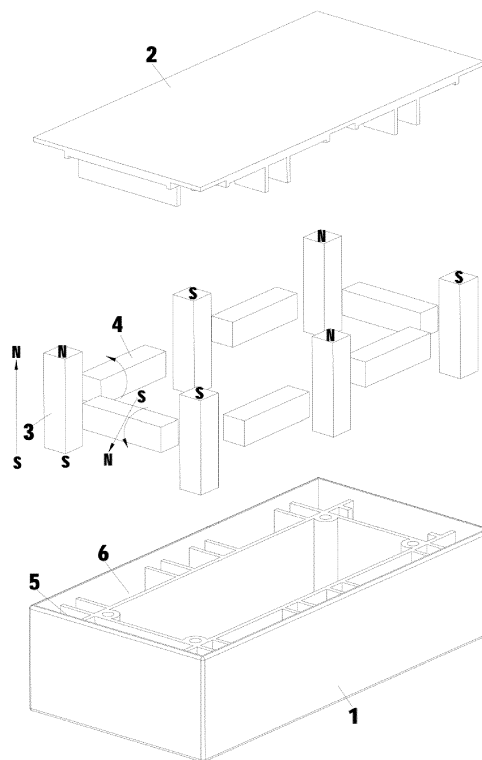


FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of Chinese Patent Application No. 202010294950.5, entitled "ALL DIMENSIONS FREE ADSORPTION MAGNETIC STRUCTURE" filed on 04/15/2020, the entire contents of which are incorporated by reference herein.

FIELD

[0002] The present disclosure relates to the field of building blocks for use as toys, and specifically to a magnetic building block having magnets inside to form all dimensions free magnetic connection between the blocks.

BACKGROUND

[0003] In toy family, magnetic building blocks can be freely combined into different forms having different structures, which can develop children's practical ability and thinking ability, are popular with children. However, most of existing magnetic building blocks can not be combined in two or all dimensions, that is end surfaces of vertical magnets of two adjacent blocks can not be absorbed to each other and side surfaces of horizontal magnets of two adjacent blocks can not be absorbed to each other, which brings inconveniences to children and reduces the user experience.

SUMMARY

[0004] In order to overcome the disadvantage of the existing magnetic building blocks, the present disclosure provides a magnetic building block having magnets inside to form universal magnetic connection between the blocks, which has a good user experience and reasonable design.

[0005] The present disclosure adopts the following technical solution: a magnetic building block for connecting with other magnetic building block including a base including at least two vertical accommodate grooves and at least one horizontal accommodate groove; a cover configured to connect with the base and cover the at least two vertical accommodate grooves and the at least one horizontal accommodate groove; at least one horizontal magnet located at the at least one horizontal accommodate groove; and at least two vertical magnets located at the at least two vertical accommodate grooves respectively, magnetic pole directions of two adjacent vertical magnets of the at least two vertical magnets being opposite to each other.

[0006] Further, the at least two vertical magnets include a plurality of vertical magnets, the at least two vertical accommodate grooves includes a plurality of vertical accommodate grooves, the plurality of vertical magnets

and the plurality of vertical accommodate grooves have equal number, the at least one horizontal magnet includes a plurality of horizontal magnets, the at least one horizontal accommodate grooves includes a plurality of horizontal accommodate grooves, and the plurality of horizontal magnets and the plurality of horizontal accommodate grooves have equal number.

[0007] Further, the plurality of vertical magnets are located at the plurality of vertical accommodate grooves respectively, the magnetic pole direction of each vertical magnet is the same as a length direction of the vertical magnet, and the magnetic pole direction of each vertical magnet is the same as a length direction of the vertical magnet and is opposite to the magnetic pole direction of the adjacent vertical magnet.

[0008] Further, the horizontal magnet defines a length direction and a thickness direction, the horizontal magnet is disposed at the horizontal accommodate groove along the thickness direction of the horizontal magnet, and the horizontal magnet is able to rotate around a virtual axis along the length direction of the horizontal magnet.

[0009] Further, a cross-section shape of the base is selected from the group of a rectangular shape, a square shape, and a triangle shape, and the cover has a shape corresponding to the cross-section shape of the base.

[0010] Further, an intersection angle between a length direction of the vertical magnet and a length direction of the horizontal magnet is 90 degree.

[0011] Further, the at least two vertical magnets and the at least one horizontal magnet are disposed alternately.

[0012] Further, the magnetic pole direction of the vertical magnet is from a south pole of the vertical magnet to a north pole of the vertical magnet and is same as a direction from a top end of the vertical magnet to a bottom end of the vertical magnet, the magnetic pole direction of the adjacent vertical magnet is from a south pole of the adjacent vertical magnet to a north pole of the adjacent vertical magnet and is same as a direction from a bottom end of the adjacent vertical magnet to a top end of the adjacent vertical magnet.

[0013] Further, poles of the at least two vertical magnets in the same horizontal plane are arranged in a selected manner from a first manner and a second manner, the first manner being a north pole, a south pole, a north pole to a south pole, and the second manner being a south pole, a north pole, a south pole to a north pole.

[0014] Further, the magnetic pole direction of the vertical magnet is along a length direction of the vertical magnet, and the magnetic pole direction of the horizontal magnet is along a thickness direction of the horizontal magnet.

[0015] The present disclosure also adopts the following technical solution: a magnetic building block for connecting with other magnetic building block including a base comprising at least one accommodate groove a cover configured to connect with the base and cover the at least one accommodate groove; at least two first mag-

nets fixed at the at least one accommodate groove, magnetic pole directions of two adjacent first magnets of the at least two first magnets being opposite to each other, and at least one second magnet located at the at least one accommodate groove.

[0016] Further, the at least two first magnets includes a plurality of first magnets, the at least one second magnet includes a plurality of second magnets, the at least one accommodate grooves includes a plurality of accommodate grooves, the plurality of horizontal magnets and the plurality of accommodate grooves have equal number, and the plurality of second magnets are located at the plurality of accommodate grooves respectively.

[0017] Further, the magnetic pole direction of each first magnet is the same as a length direction of the first magnet, and the magnetic pole direction of each first magnet is the same as a length direction of the first magnet and is opposite to the magnetic pole direction of the adjacent first magnet.

[0018] Further, the second magnet defines a length direction and a thickness direction, the second magnet is disposed at the accommodate groove along the thickness direction of the second magnet, and the second magnet is able to rotate around a virtual axis along the length direction of the second magnet.

[0019] Further, a cross-section shape of the base is selected from the group of a rectangular shape, a square shape, and a triangle shape, and the cover has a shape corresponding to the cross-section shape of the base.

[0020] Further, an intersection angle between a length direction of the first magnet and a length direction of the second magnet is 90 degree.

[0021] Further, the at least two first magnets and the at least one second magnet are disposed alternately.

[0022] Further, the magnetic pole direction of the first magnet is from a south pole of the first magnet to a north pole of the first magnet and is same as a direction from a top end of the first magnet to a bottom end of the first magnet, the magnetic pole direction of the adjacent first magnet is from a south pole of the adjacent first magnet to a north pole of the adjacent first magnet and is same as a direction from a bottom end of the adjacent first magnet to a top end of the adjacent first magnet.

[0023] Further, poles of the at least two first magnets in the same plane vertical to a length direction of the at least two first magnets are arranged in a selected manner from a first manner and a second manner, the first manner being a north pole, a south pole, a north pole to a south pole, and the second manner being a south pole, a north pole, a south pole to a north pole.

[0024] Further, the magnetic pole direction of the first magnet is along a length direction of the first magnet, and the magnetic pole direction of the second magnet is along a thickness direction of the second magnet.

[0025] The present disclosure also has the beneficial effects: magnetic pole directions of two adjacent first magnets are opposite to each other, poles of the at least two first magnets in the same plane are arranged in a

selected manner from the first manner and the second manner, such that all of the magnetic building blocks are arranged regularly. Further, the poles of the first magnets of the magnetic building block with the first manner can be connected with the poles of the first magnets of the adjacent magnetic building block with the second manner in the vertical direction, and the second magnet of the magnetic building block may freely rotate so as to connect with the second magnet of the adjacent magnetic building block in the horizontal direction. Thus, two adjacent blocks can be connected with each other easily in the vertical direction and the horizontal direction, which brings conveniences to children, improves the user experience and has reasonable design.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] For the purpose of a clearer description of the embodiments in this application or technical solutions in prior art, below is a brief introduction of the attached drawings needed to be used in the description of the embodiments or prior art. Apparently, the attached drawings in the following description are only some embodiments indicated in the present application. For ordinary skill in the art, they may obtain other drawings according to these attached drawings without any innovative laboring.

[0027] The present disclosure will be further described with reference to the attached drawings and the embodiments hereunder.

FIG. 1 is an explosive view of a magnetic building block according to a first embodiment of the present disclosure.

FIG. 2 is an explosive view of a magnetic building block according to a second embodiment of the present disclosure.

FIG. 3 is an explosive view of a magnetic building block according to a third embodiment of the present disclosure.

FIG. 4 is an explosive view of a magnetic building block according to a fourth embodiment of the present disclosure.

FIG. 5 is an explosive view of a magnetic building block according to a fifth embodiment of the present disclosure.

FIG. 6 is an explosive view of a magnetic building block according to a sixth embodiment of the present disclosure.

FIG. 7 is a schematic diagram of a plurality of magnetic building blocks according to above embodiments of the present disclosure connected with each other to build a toy house.

DETAILED DESCRIPTION

[0028] In order to provide a clear understanding of the objects, features, and advantages of the embodiments, the following are detailed and complete descriptions to

the technological solutions adopted in the embodiments. Obviously, the descriptions are part of the whole embodiments. The other embodiments which are not processed creatively by technicians of ordinary skills in the field are under the protection of this disclosure. The same is given with reference to the drawings and specific embodiments. It should be noted that non-conflicting embodiments in the disclosure and the features in the embodiments may be combined with each other without conflict.

[0029] In the following description, numerous specific details are set forth in order to provide a full understanding of the disclosure. The disclosure may be practiced otherwise than as described herein. The following specific embodiments are not to limit the scope of the disclosure.

[0030] Unless defined otherwise, all technical and scientific terms herein have the same meaning as used in the field of the art as generally understood. The terms used in the disclosure are to describe particular embodiments and are not intended to limit the disclosure.

[0031] The disclosure, referencing the accompanying drawings, is illustrated by way of examples and not by way of limitation. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references mean "at least one."

[0032] FIG. 1~FIG. 6 show magnetic building blocks according to embodiments of the present disclosure and toy house build by the magnetic building blocks, and FIG. 7 shows a schematic diagram of a plurality of magnetic building blocks according to above embodiments of the present disclosure connected with each other to build a toy house. The magnetic building block for connecting with other magnetic building block includes a base 1 having at least two vertical accommodate grooves 5 and at least one horizontal accommodate groove 6, a cover 2 configured to connect with the base 1 and cover the at least two vertical accommodate grooves 5 and the at least one horizontal accommodate groove 6, at least one horizontal magnet 4 located at the at least one horizontal accommodate groove 6, and at least two vertical magnets 3 located at the at least two vertical accommodate grooves 5. Magnetic pole directions of two adjacent vertical magnets 3 of the at least two vertical magnets 3 are opposite to each other.

[0033] In the embodiments, the magnetic building block includes a plurality of vertical magnets 3 and a plurality of horizontal magnets 4. The base 1 includes a plurality of vertical accommodate grooves 5 and a plurality of horizontal accommodate grooves 6. The plurality of vertical magnets 3 and the plurality of vertical accommodate grooves 5 have equal number. The plurality of horizontal magnets 4 and the plurality of horizontal accommodate grooves 6 have equal number.

[0034] In the embodiments, the plurality of vertical magnets 3 are located at the plurality of vertical accommodate grooves 5 respectively. The magnetic pole direction of each vertical magnet 3 is the same as a length

direction of the vertical magnet 3. The magnetic pole direction of each vertical magnet 3 is the same as a length direction of the vertical magnet 3 and is opposite to the magnetic pole direction of the adjacent vertical magnet 3.

[0035] In the embodiments, the horizontal magnet 4 defines a length direction and a thickness direction. The horizontal magnet 4 is disposed at the horizontal accommodate groove 6 along the thickness direction. The horizontal magnet 4 is able to rotate around a virtual axis along the length direction of the horizontal magnet 4.

[0036] In the embodiments, a cross-section shape of the base 1 along the horizontal plane is selected from the group of a rectangular shape, a square shape, and a triangle shape, and the cover 2 has a shape corresponding to the cross-section shape of the base 1.

[0037] In the embodiments, an intersection angle between a length direction of the vertical magnet 3 and a length direction of the horizontal magnet 4 can be 90 degree or other degree. The vertical magnets 3 and the horizontal magnet 4 are disposed alternately, and there is at least one horizontal magnet 4 disposed between two adjacent vertical magnets 4. Further, poles of the at least two vertical magnets 3 in the same horizontal plane are arranged in a first manner or a second manner. The first manner is a north pole, a south pole, a north pole to a south pole (that is N-S-N-S), and the second manner is a south pole, a north pole, a south pole to a north pole (that is S-N-S-N).

[0038] In the embodiments, the magnetic pole direction of the vertical magnet 3 is from a south pole of the vertical magnet 3 to a north pole of the vertical magnet 3 (that is S-N) and is same as a direction from a top end of the vertical magnet 3 to a bottom end of the vertical magnet 3. The magnetic pole direction of the adjacent vertical magnet 3 is from a south pole of the adjacent vertical magnet 3 to a north pole of the adjacent vertical magnet 3 and is same as a direction from a bottom end of the adjacent vertical magnet 3 to a top end of the adjacent vertical magnet 3. Furthermore, the magnetic pole direction of the vertical magnet 3 is along a length direction of the vertical magnet 3, and the magnetic pole direction of the horizontal magnet 4 is along the thickness direction of the horizontal magnet 4.

[0039] The present disclosure has the beneficial effects: magnetic pole directions of two adjacent vertical magnets 3 are opposite to each other, poles of the at least two vertical magnets 3 in the same horizontal plane are arranged in a selected manner from the first manner (N-S-N-S) and the second manner (S-N-S-N), such that all of the magnetic building blocks are arranged regularly. In addition, the poles of the vertical magnets 3 of the magnetic building block with the first manner can be connected with the poles of the vertical magnets 3 of the adjacent magnetic building block with the second manner in the vertical direction, and the horizontal magnet 4 of the magnetic building block may freely rotate so as to connect with the horizontal magnet 4 of the adjacent magnetic building block 4 in the horizontal direction.

[0040] As mentioned, in the above magnetic building block of present disclosure, the vertical magnets 3 of the magnetic building block can be connected with the poles of the vertical magnets 3 of the adjacent magnetic building block in the vertical direction, and the horizontal magnet 4 of the magnetic building block may freely rotate so as to connect with the horizontal magnet of the adjacent magnetic building block 4 in the horizontal direction. Thus, two adjacent blocks can be connected with each other easily in the vertical direction and the horizontal direction, which brings conveniences to children and improves the user experience, and has reasonable design.

[0041] It can be understood, if the vertical magnets 3 of one magnetic building block are arranged in first manner of N-S-N-S, the vertical magnets 3 of other magnetic building block should be arranged in first manner of N-S-N-S such that two adjacent magnetic building block can have opposites attract, otherwise two adjacent magnetic building block will repel each other.

[0042] Finally, it should be noted that above embodiments are merely used for illustrating the technical solutions of the disclosure, rather than limiting the disclosure; though the disclosure is illustrated in detail with reference to the aforementioned embodiments, it should be understood by those of ordinary skill in the art that modifications may still be made on the technical solutions disclosed in the aforementioned respective embodiments, or equivalent substitutions may be made to a part of technical features thereof; and these modifications or substitutions do not make the essence of the corresponding technical solutions depart from the spirit and scope of the technical solutions of the respective embodiments of the disclosure.

Claims

1. A magnetic building block for connecting with other magnetic building block, comprising:

a base comprising at least two vertical accommodate grooves and at least one horizontal accommodate groove;
a cover configured to connect with the base and cover the at least two vertical accommodate grooves and the at least one horizontal accommodate groove;
at least one horizontal magnet located at the at least one horizontal accommodate groove; and
at least two vertical magnets located at the at least two vertical accommodate grooves respectively, magnetic pole directions of two adjacent vertical magnets of the at least two vertical magnets being opposite to each other.

2. The magnetic building block according to claim 1, wherein the at least two vertical magnets comprise a plurality of vertical magnets, the at least two vertical

accommodate grooves comprises a plurality of vertical accommodate grooves, the plurality of vertical magnets and the plurality of vertical accommodate grooves have equal number, the at least one horizontal magnet comprises a plurality of horizontal magnets, the at least one horizontal accommodate grooves comprises a plurality of horizontal accommodate grooves, and the plurality of horizontal magnets and the plurality of horizontal accommodate grooves have equal number.

3. The magnetic building block according to claim 2, wherein the plurality of vertical magnets are located at the plurality of vertical accommodate grooves respectively, the magnetic pole direction of each vertical magnet is the same as a length direction of the vertical magnet, and the magnetic pole direction of each vertical magnet is the same as a length direction of the vertical magnet and is opposite to the magnetic pole direction of the adjacent vertical magnet.
4. The magnetic building block according to claim 1, wherein the horizontal magnet defines a length direction and a thickness direction, the horizontal magnet is disposed at the horizontal accommodate groove along the thickness direction of the horizontal magnet, and the horizontal magnet is able to rotate around a virtual axis along the length direction of the horizontal magnet.
5. The magnetic building block according to claim 1, wherein a cross-section shape of the base is selected from the group of a rectangular shape, a square shape, and a triangle shape, and the cover has a shape corresponding to the cross-section shape of the base.
6. The magnetic building block according to claim 1, wherein an intersection angle between a length direction of the vertical magnet and a length direction of the horizontal magnet is 90 degree.
7. The magnetic building block according to claim 1, wherein the at least two vertical magnets and the at least one horizontal magnet are disposed alternately.
8. The magnetic building block according to claim 1, wherein the magnetic pole direction of the vertical magnet is from a south pole of the vertical magnet to a north pole of the vertical magnet and is same as a direction from a top end of the vertical magnet to a bottom end of the vertical magnet, and the magnetic pole direction of the adjacent vertical magnet is from a south pole of the adjacent vertical magnet to a north pole of the adjacent vertical magnet and is same as a direction from a bottom end of the adjacent vertical magnet to a top end of the adjacent

vertical magnet.

9. The magnetic building block according to claim 1, wherein poles of the at least two vertical magnets in the same horizontal plane are arranged in a selected manner from a first manner and a second manner, the first manner being a north pole, a south pole, a north pole to a south pole, and the second manner being a south pole, a north pole, a south pole to a north pole.
10. The magnetic building block according to claim 1, wherein the magnetic pole direction of the vertical magnet is along a length direction of the vertical magnet, and the magnetic pole direction of the horizontal magnet is along a thickness direction of the horizontal magnet.
11. A magnetic building block for connecting with other magnetic building block, comprising:
 - a base comprising at least one accommodate groove;
 - a cover configured to connect with the base and cover the at least one accommodate groove;
 - at least two first magnets fixed at the at least one accommodate groove, magnetic pole directions of two adjacent first magnets of the at least two first magnets being opposite to each other, and
 - at least one second magnet located at the at least one accommodate groove.
12. The magnetic building block according to claim 11, wherein the at least two first magnets comprises a plurality of first magnets, the at least one second magnet comprises a plurality of second magnets, the at least one accommodate grooves comprises a plurality of accommodate grooves, the plurality of horizontal magnets and the plurality of accommodate grooves have equal number, and the plurality of second magnets are located at the plurality of accommodate grooves respectively.
13. The magnetic building block according to claim 12, wherein the magnetic pole direction of each first magnet is the same as a length direction of the first magnet, and the magnetic pole direction of each first magnet is the same as a length direction of the first magnet and is opposite to the magnetic pole direction of the adjacent first magnet.
14. The magnetic building block according to claim 12, wherein the second magnet defines a length direction and a thickness direction, the second magnet is disposed at the accommodate groove along the thickness direction of the second magnet, and the second magnet is able to rotate around a virtual axis

along the length direction of the second magnet.

15. The magnetic building block according to claim 11, wherein the magnetic pole direction of the first magnet is from a south pole of the first magnet to a north pole of the first magnet and is same as a direction from a top end of the first magnet to a bottom end of the first magnet, the magnetic pole direction of the adjacent first magnet is from a south pole of the adjacent first magnet to a north pole of the adjacent first magnet and is same as a direction from a bottom end of the adjacent first magnet to a top end of the adjacent first magnet.
- 15 Amended claims in accordance with Rule 137(2) EPC.
 1. A magnetic building block for connecting with other magnetic building block, comprising:
 - a base (1) comprising at least two vertical accommodate grooves (5) and at least one horizontal accommodate groove (6);
 - a cover (2) configured to connect with the base (1) and cover (2) the at least two vertical accommodate grooves (5) and the at least one horizontal accommodate groove (6);
 - at least one horizontal magnet (4) having length direction and thickness direction the magnetic pole direction is the same direction as the thickness direction from a south pole to a north pole, the horizontal magnet being able to rotate about around a virtual axis along the length direction, located with its axis horizontally in the at least one horizontal accommodate groove (6); and
 - at least two vertical magnets (3) having length direction and thickness direction the magnetic pole direction is the same as the length direction from a south pole to a north pole located with its length axis vertically in the at least two vertical accommodate grooves (5) respectively, the magnetic pole directions of two adjacent vertical magnets of the at least two vertical magnets (3) being opposite to each other.
 2. The magnetic building block according to claim 1, wherein the at least two vertical magnets comprise a plurality of vertical magnets, the at least two vertical accommodate grooves (5) comprises a plurality of vertical accommodate grooves (5), the plurality of vertical magnets (3) and the plurality of vertical accommodate grooves (5) have equal number, the at least one horizontal magnet (4) comprises a plurality of horizontal magnets (4), the at least one horizontal accommodate grooves (6) comprises a plurality of horizontal accommodate grooves (6), and the plurality of horizontal magnets (6) and the plurality of horizontal accommodate grooves (6) have equal number.

3. The magnetic building block according to claim 1,
wherein a cross-section shape of the base is select-
ed from the group of a rectangular shape, a square
shape, and a triangle shape, and the cover has a
shape corresponding to the cross-section shape of 5
the base.

4. The magnetic building block according to claim 1,
wherein an intersection angle between a length di-
rection of the vertical magnet (3) and a length direc- 10
tion of the horizontal magnet (4) is 90 degree.

5. The magnetic building block according to claim 1,
wherein the at least two vertical magnets (3) and the
at least one horizontal magnet (4) are disposed al- 15
ternately.

6. The magnetic building block according to claim 1,
wherein the magnetic pole direction of the vertical
magnet (3) is from a south pole of the vertical magnet 20
(3) to a north pole of the vertical magnet (3) and is
same as a direction from a top end of the vertical
magnet to a bottom end of the vertical magnet, and
the magnetic pole direction of the adjacent vertical 25
magnet (3) is from a south pole of the adjacent ver-
tical magnet to a north pole of the adjacent vertical
magnet and is same as a direction from a bottom
end of the adjacent vertical magnet to a top end of
the adjacent vertical magnet (3). 30

7. The magnetic building block according to claim 1,
wherein poles of the at least two vertical magnets
(3) in the same horizontal plane are arranged in a
selected manner from a first manner and a second
manner, the first manner being a north pole, a south 35
pole, a north pole to a south pole, and the second
manner being a south pole, a north pole, a south
pole to a north pole.

8. The magnetic building block according to claim 1, 40
wherein the magnetic pole direction of the vertical
magnet (3) is along a length direction of the vertical
magnet, and the magnetic pole direction of the hor-
izontal magnet (4) is along a thickness direction of
the horizontal magnet. 45

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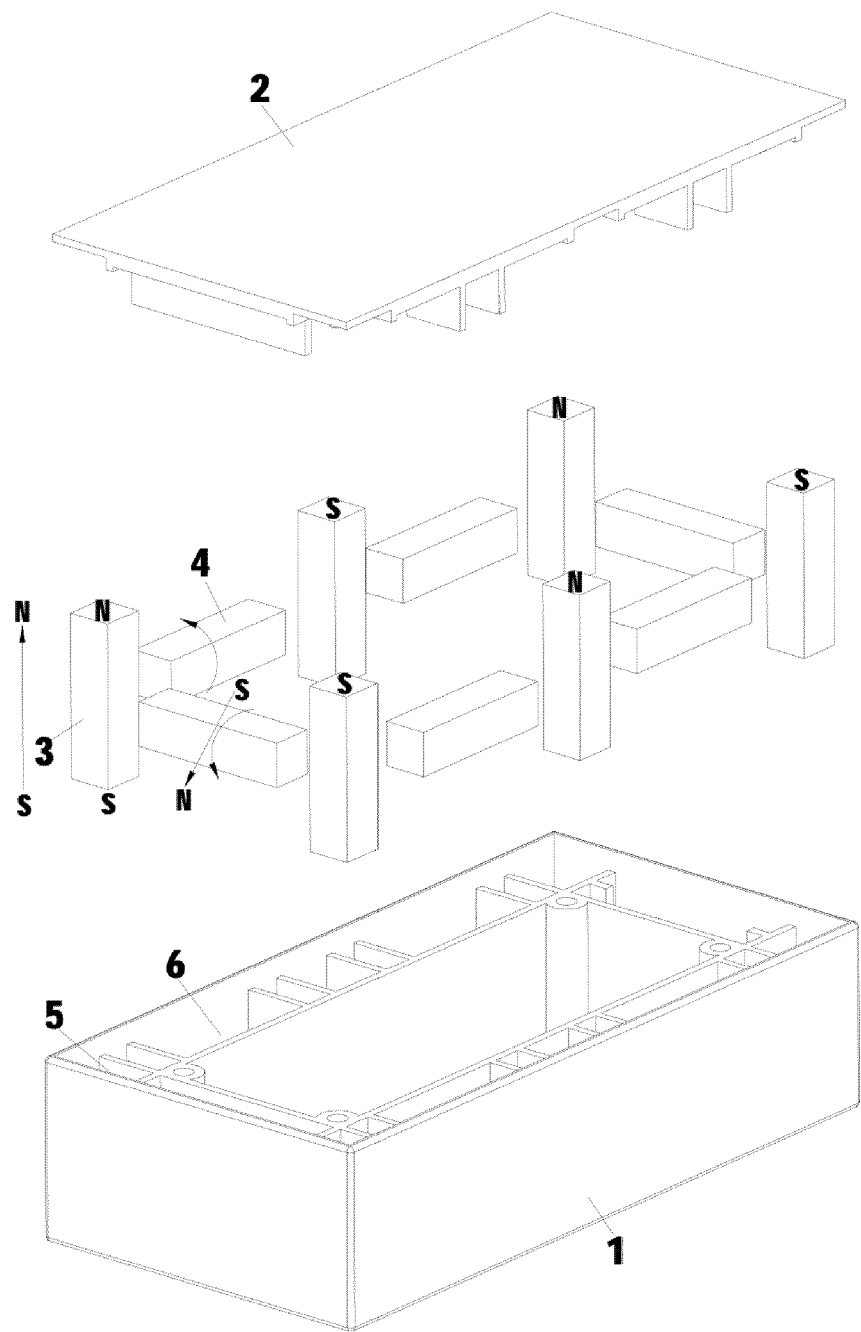


FIG. 1

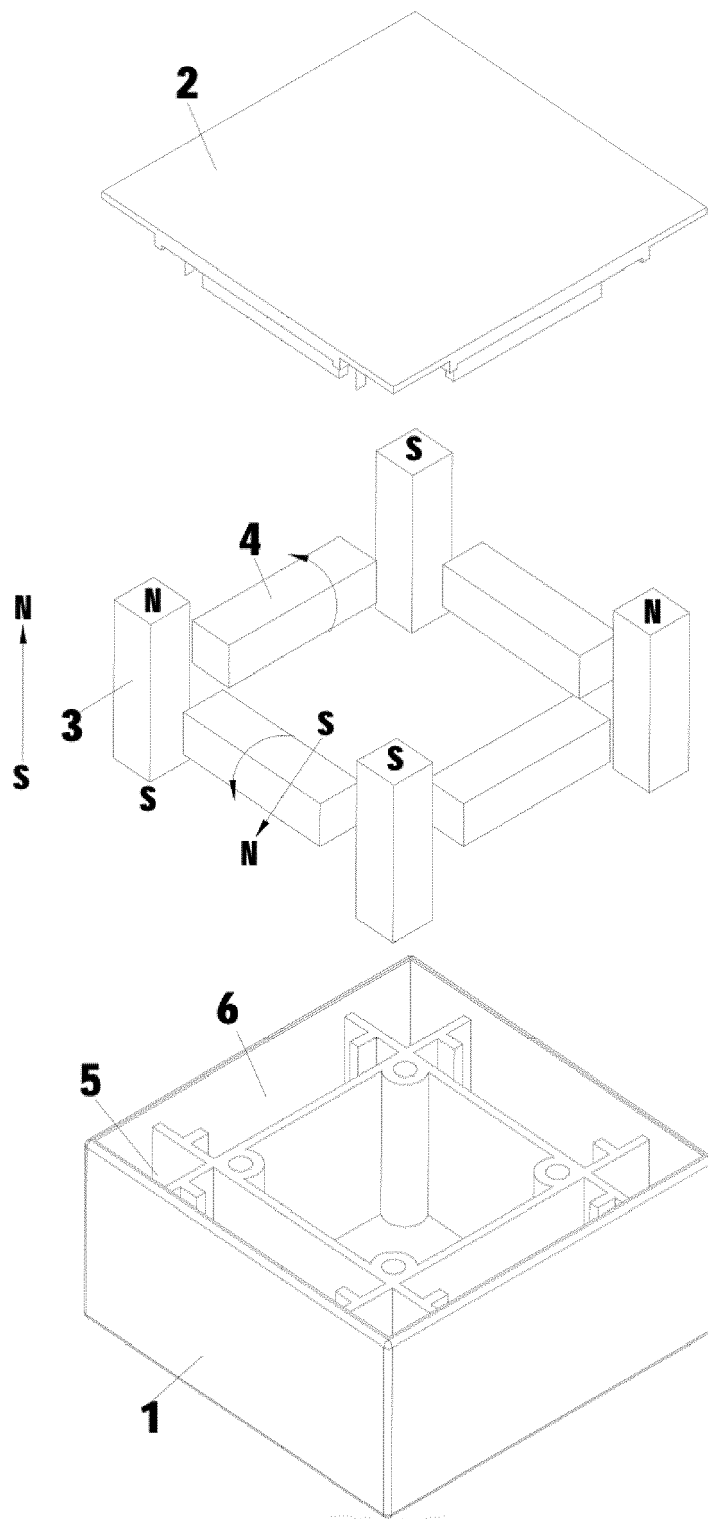


FIG. 2

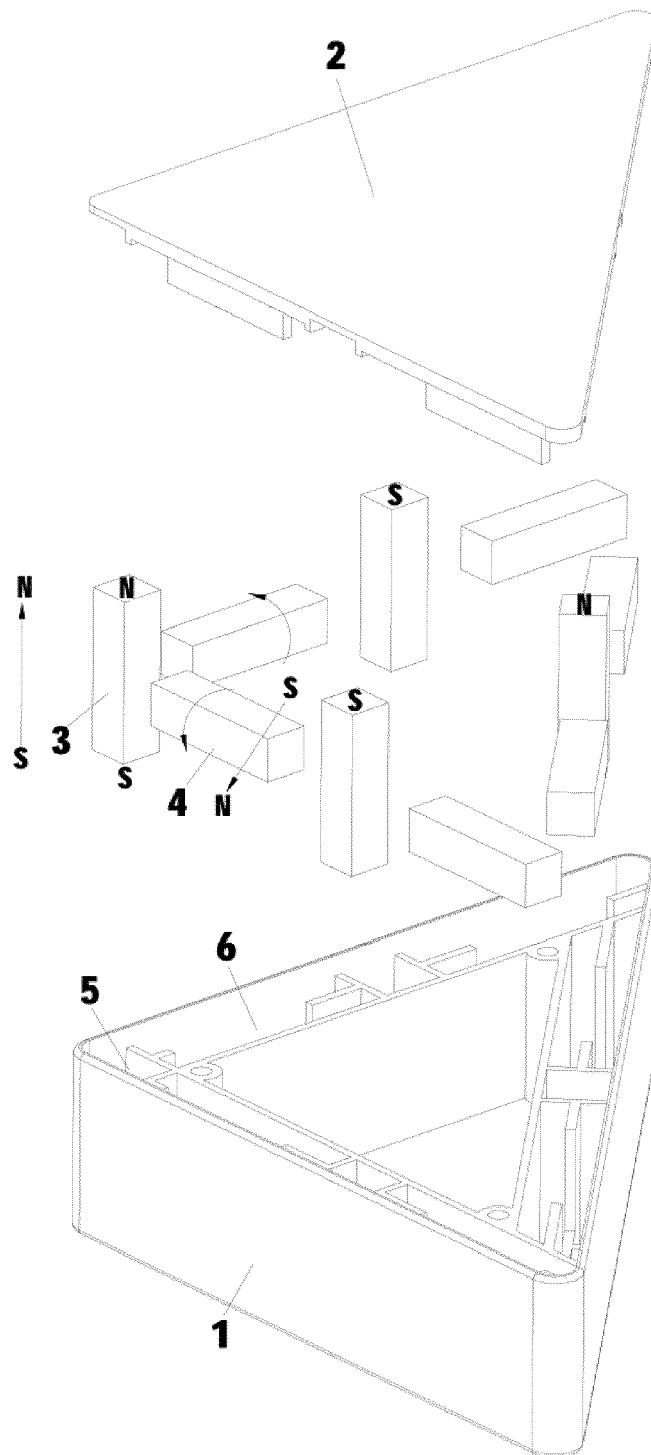


FIG. 3

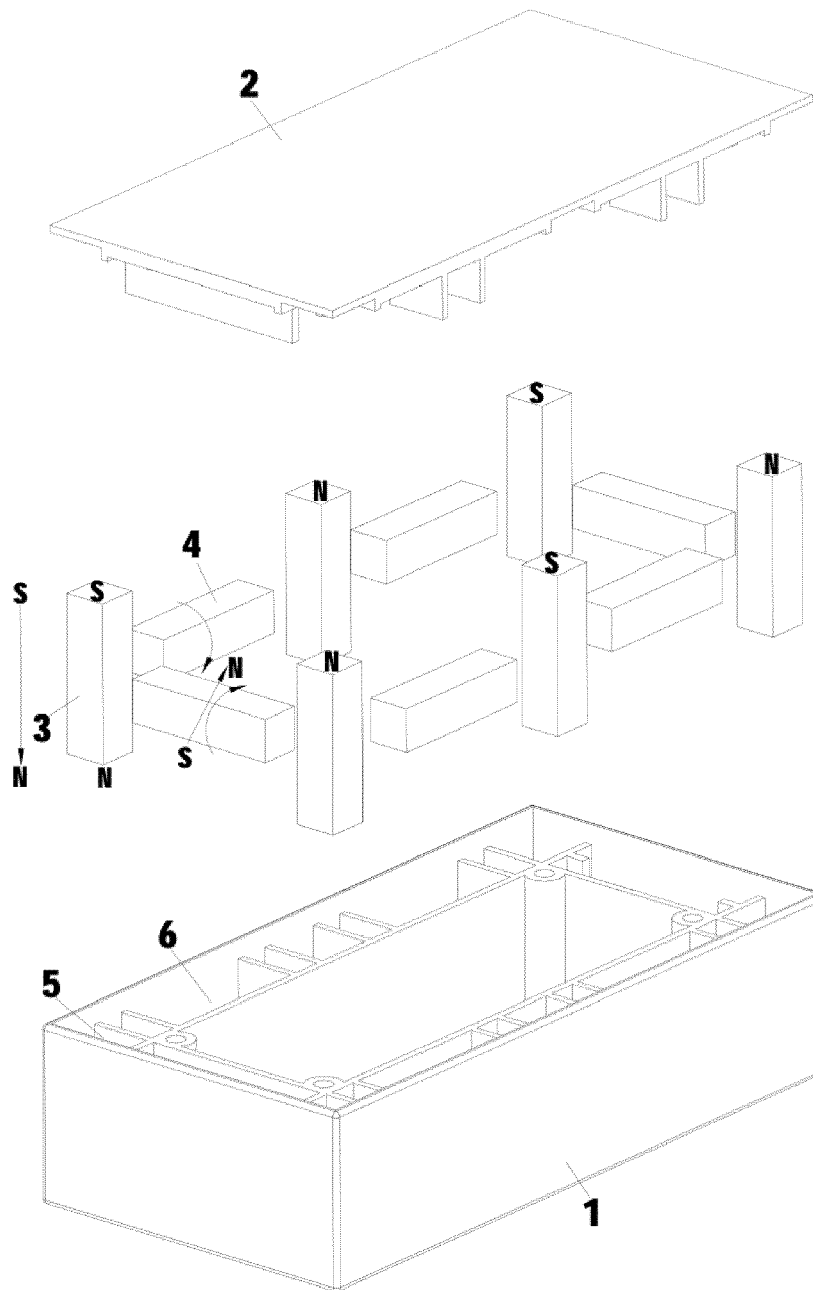


FIG. 4

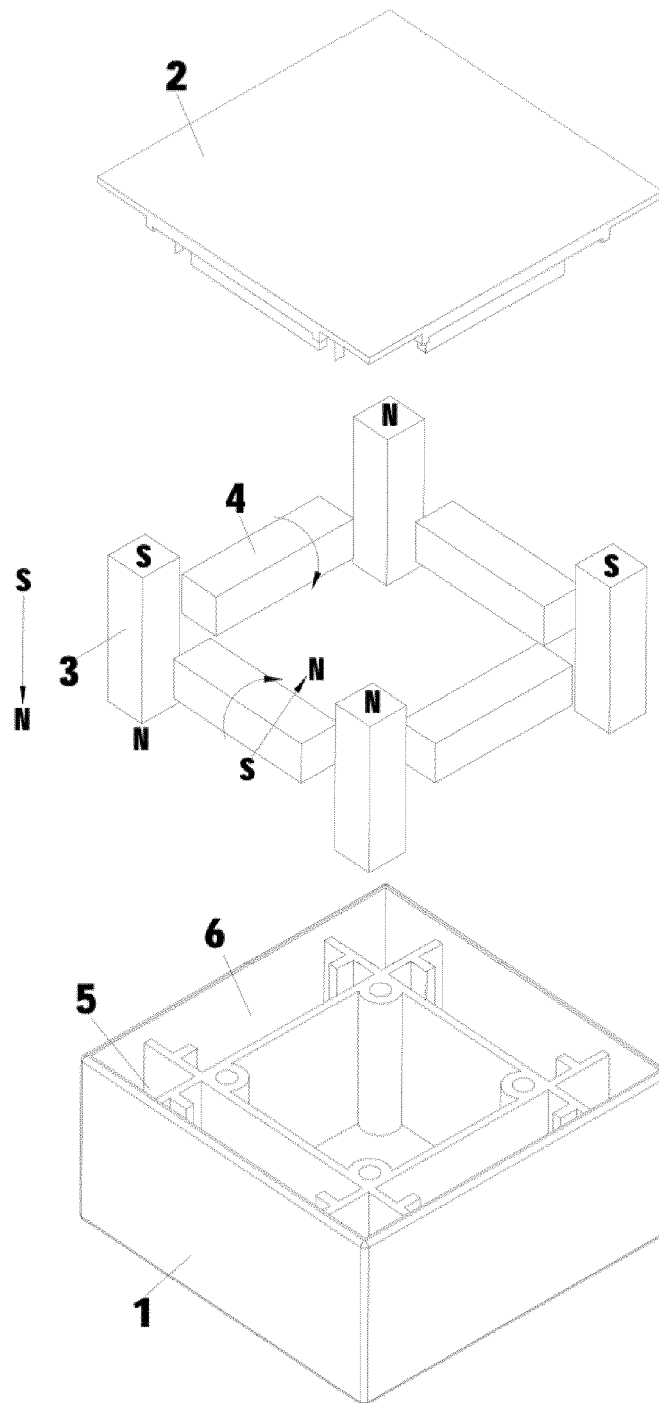


FIG. 5

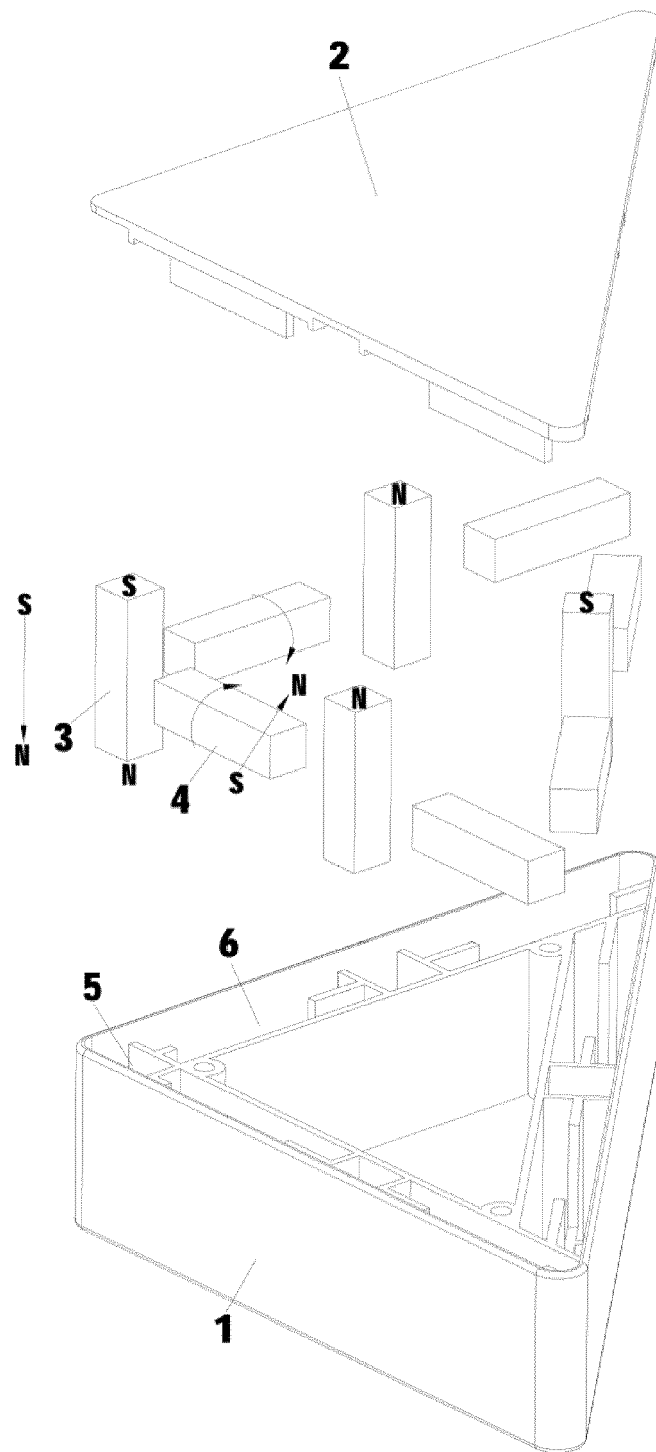


FIG. 6

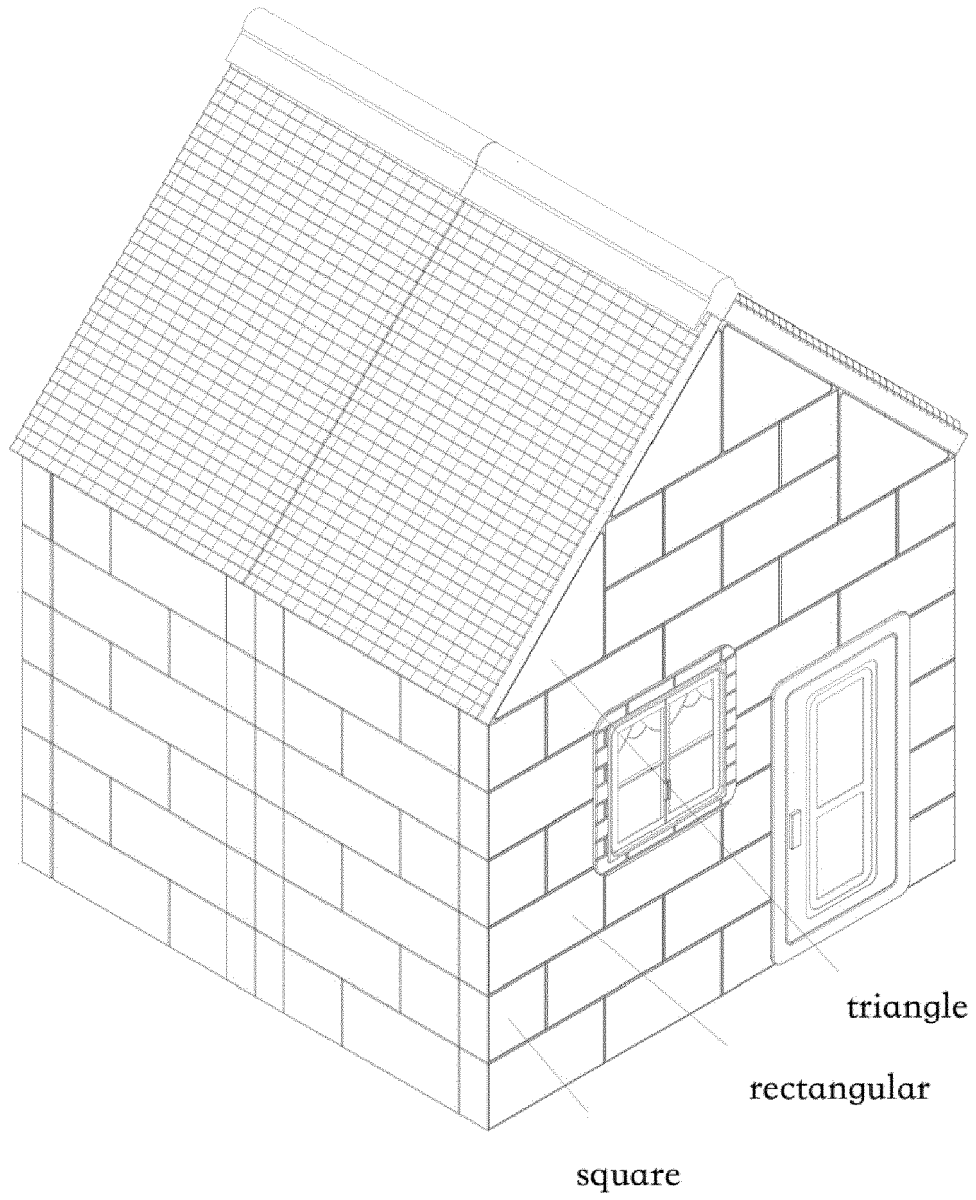


FIG. 7



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 17 9864

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 November 2020	Examiner Lucas, Peter
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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